

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
4 December 2003 (04.12.2003)

PCT

(10) International Publication Number
WO 03/099523 A2

(51) International Patent Classification⁷:

B25H

(21) International Application Number: PCT/IB03/02037

(22) International Filing Date: 27 May 2003 (27.05.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
02113121.X 27 May 2002 (27.05.2002) CN

(71) Applicant (for all designated States except US):
POSITEC POWER TOOLS (SUZHOU) CO., LTD.
[CN/CN]; 461 East Ganjiang Road, Suzhou 215006 (CN).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **CHENGDAO, Li**
[CN/CN]; 461, East Ganjiang Road, Suzhou 215006
(CN). **BIN, Zhang** [CN/CN]; Room 202, Flat 3,
Huayanghuayuan Suzhou Jiangsu Province (CN).

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

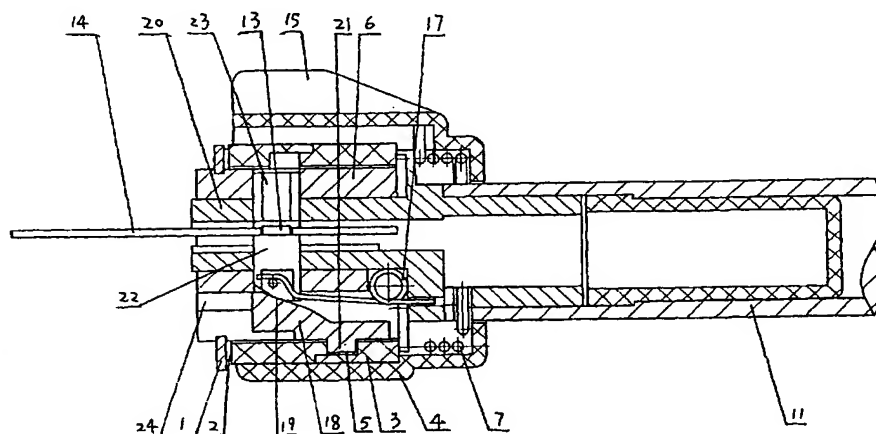
(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— without international search report and to be republished upon receipt of that report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: A RECIPROCATING POWER TOOL



(57) **Abstract:** The present invention relates to a reciprocating power tool, more particularly, relates to a clamping device for a blade which will cut the workpiece when the cutting work is doing. The reciprocating power tool comprises: a housing, a reciprocating rod subassembly, an operating member clamping mechanism. The operating member clamping mechanism includes an actuating subassembly, a locking subassembly, said actuating subassembly includes a rotating sleeve, a sliding block, there is thread provided in the inner surface of the rotating sleeve, a guiding projection outside the sliding block inserts into said thread grooves, an inclined guiding surface provided with the interior of the sliding block is engaged with the corresponding inclined guiding surface which is provided with a locking pin, by the guiding projection engaging with said thread grooves, when the rotating sleeve rotate and then carry the guiding projection moving in the axial direction of the reciprocating rod subassembly, then the sliding block carry the locking pin moving in the radial direction, thus the operation is easy to carry through and the rotating sleeve is rotatable in a large angle range.

A RECIPROCATING POWER TOOL

Technical field

The present invention relates to a reciprocating power tool with an operating member clamping mechanism.

5 Background Information

In the prior art, US6209208 has disclosed a clamping mechanism, which composed of an outer cam surface and an inner cam surface, a locking subassembly includes an outer follower surface adapted to be driven by said
10 outer cam surface and an inner follower surface adapted to be driven by said cam surface, whereby, the locking subassembly can move in the radial direction and lock the blade when actuating subassembly rotates. Said inner cam surface directly press on the said outer cam
15 surface to actuate the later move in the radial direction, that result in the difficult operation of this kind of clamping device. Furthermore, the components which composed of said clamping device almost are cutting members, these components own
20 relative large manufacturing errors, and these errors are accumulated when all components are assembled together. And it is much difficult to manufacture this kind integral cam.

Invention Content

CONFIRMATION COPY

The present invention is to provide a new and improved blade clamping mechanism with easy operating structure for reciprocating power tools.

The technical proposal of the present invention is:
5 a reciprocating power tool, which comprises:

A housing;

A reciprocating rod subassembly, which exerts reciprocating movement in said housing, has an end for receiving an operating member;

10 An operating member clamping device, which is provided on the said reciprocating rod subassembly; further said operating member clamping device also includes:

An actuating subassembly, which disposed on said
15 end of said reciprocating rod subassembly, said actuating member has an engaged position and a disengaged position, said actuating member can move relative to said reciprocating rod subassembly between the engaged position and said disengaged position;

20 A locking subassembly, which has two operating positions, a first locking position is the operating member being locked in the reciprocating rod subassembly, a second unlocking position is said operating member being released, said locking

subassembly is movable between these two operating positions. Said locking subassembly moves from said first locking position to said second unlocking position when said actuating subassembly moves from
5 said engaged position to said disengaged position; said locking subassembly moves from said second unlocking position to said first locking position when said actuating subassembly moves from said disengaged position to said engaged position;

10 Said actuating subassembly includes at least one rotating sleeve which is rotatable relative to said reciprocating rod subassembly, one sliding block which can slide relative to said reciprocating rod subassembly in the axis direction of said reciprocating
15 rod subassembly, there are thread grooves in the inner surface of said rotating sleeve, there is a guiding projection in the exterior side of the sliding block, and said guiding projection insert into the thread grooves, and inclined or curved guiding surface are
20 provided in the interior side of said sliding block;

Said locking subassembly includes at least one pin which is movable relative to said reciprocating rod subassembly, the outside end of the said pins configured in the inclined or curved guiding surface

which contact with the corresponding inclined or curved guiding surface of the sliding block.

Compared with the prior art, the present invention own the following advantages: by design said thread
5 grooves engaging with said projection, said projection is carrying and moving easily in the axial direction of the reciprocating rod subassembly when said rotating sleeve is rotating and actuating said sliding block carry the pin moving in the radial direction, whereby
10 such a clamping mechanism is easily operated by an operator.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows a sectional view of the operating member
15 clamping mechanism in the first embodiment responsible to the present invention, operating member is being released;

FIG. 2 shows a sectional view of the operating member clamping mechanism in the first embodiment responsible
20 to the present invention, operating member is being locked;

FIG. 3 shows the main view of the operating member clamping mechanism;

FIG. 4 shows the sectional view along the line D-D of

the FIG. 3. (An operating member released);

FIG. 5 shows the sectional view along the line D-D of the FIG. 3. (An operating member locked);

FIG. 6 shows the left view of the operating member clamping mechanism; (An operating member released)

5

FIG. 7 shows the sectional view along the line A-A of the FIG. 3. (An operating member locked);

FIG. 8 shows the sectional view along the line A-A of the FIG. 3. (An operating member released);

10

FIG. 9 shows a sectional view of the operating member clamping mechanism in the second embodiment responsible to the present invention; (An operating member released)

FIG. 10 shows a sectional view of the operating member clamping mechanism in the first embodiment responsible

15

to the present invention; (An operating member locked)

FIG. 11 shows the sectional view along the line D-D of the operating member clamping mechanism in the second embodiment; (An operating member released)

FIG. 12 shows the sectional view along the line D-D of

20

the operating member clamping mechanism in the second embodiment; (An operating member locked)

FIG. 13 shows an exploded perspective view of the reciprocating rod subassembly and the operating member clamping mechanism;

FIG. 14 shows a shape view of the present invention;
FIG. 15 shows three enlarged projective views of said sliding block;
FIG. 16 shows two enlarged projective views of said
5 fork sleeve;
FIG. 17 shows two enlarged projective views of said pin body;
FIG. 18 shows the sectional view along a longitudinal direction center plane E;
10 FIG. 19 shows a projective view of two inner sleeves;
In all the FIGS, the number respectively indicated to:
[1]□a compressing ring ; [2]□a washer ; [3]□an inner sleeve ; [4]□an outer sleeve; [5]□the thread groove ;
[6]□a fork sleeve ; [7]□a first torsion spring ; [8]□a
15 compressing groove; [9]□a compression spring; [10]□a sleeve; [11]□a reciprocating rod subassembly; [12]□a pushing plate; [13]□a pin; [14]□a operating member;
[15]□an actuating ear; [16]□a slot; [17]□a second torsion spring; [18]□a sliding block; [19]□an inclined
20 surface; [20]□a fork; [21]□a guiding projection; [22]□a pin body; [23]□an elastic cylindrical pin; [24]□the sliding groove of the sliding block.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention is a reciprocating power tool
(see FIG. 14), which comprises:

A housing;

A reciprocating rod subassembly at least includes a
5 projecting rod, a fork and a fork sleeve, which exerts
reciprocating movement in said housing and has an end
receiving an operating member [14];

An operating member clamping device which is
provided on said reciprocating rod subassembly[11];
10 further said operating member clamping device also
includes:

An actuating subassembly, which disposed on said
end of said reciprocating rod subassembly, said
actuating member has an engaged position (see FIG.5 and
15 FIG. 12) and a disengaged position (see FIG. 4 and FIG.
11), said actuating member is movable relative to said
reciprocating rod subassembly between the engaged
position and said disengaged position;

A locking subassembly, which has two operating
20 positions, a first locking position (see FIG. 5 and
FIG. 12) is the operating member [14] being locked in
the locking position of said reciprocating rod
subassembly, a second unlocking position (see FIG. 4
and FIG. 11) is said operating member being released,

said locking subassembly is movable between these two operating positions. Said locking subassembly moves from said first locking position to said second unlocking position when said actuating subassembly
5 moves from said engaged position to said disengaged position; said locking subassembly moves from said second unlocking position to said first locking position when said actuating subassembly moves from said disengaged position to said engaged position;

10 Said actuating subassembly at least includes one rotating sleeve which is rotatable relative to said reciprocating rod subassembly, one sliding block [18] which is slidable relative to said reciprocating rod subassembly in the axial direction of said
15 reciprocating rod subassembly, there are thread grooves [5] in the inner surface of said rotating sleeve, there is a guiding projection [21] in the exterior of the sliding block [18], and said guiding projection [21] insert into the thread grooves [5], inclined or curved
20 guiding surface are provided in the interior side of said sliding block [18]; said rotating sleeve is a connected member which composed of the outer sleeve [4] and the inner sleeve [3].

Said locking subassembly at least includes one

pin body [22] which is movable relative to said reciprocating rod subassembly, the outside end of said pin body [22] configured in the inclined or curved surface [25] which contact with the corresponding
5 inclined or curved surface [19] which formed on said sliding block [18], whereby the pin body [22] move in the radial direction when the sliding block move in the axial direction of the reciprocating rod subassembly .

Two end portions of a second torsion spring [17]
10 respectively connect with said pin body [22] and said reciprocating rod subassembly, and said second torsion spring [17] make said pin body [22] have a tendency of moving from the locking position to the unlocking position.

15 There is a first torsion spring [7] which ring the outside of said reciprocating rod subassembly, and one end of the first torsion spring [7] connect with said reciprocating rod subassembly, and the other end of said first torsion spring [7] connect with the
20 rotating sleeve. FIG 4 shows the condition of said first torsion spring connecting to the outer sleeve [4] of the rotating sleeve.

The outer surface of the said rotating sleeve has actuating ears [15] which is extended in the radial

direction, rotate said actuating ears [15], thus said rotating sleeve is carried to be rotating.

FIG 12, a axially extending sliding groove of sliding block [24] is disposed on said reciprocating rod subassembly, said sliding block [18] is disposed in said sliding groove [24] and is movable in the axial direction. In detailed, one end portion of said reciprocating rod subassembly is a forked body [20], a fork body sleeve [6] ring outside of the forked body [20], and a elastic cylindrical pin [23] joined the sleeve [6] and the forked body [20] and thereby formed an integrative member. Said sliding groove of sliding block [24] is set in the wall of the said fork body sleeve [6].

The end portion of said reciprocating rod subassembly for receiving the operating member [14] has a slot [16] provided for containing said operating member [14]; said reciprocating rod subassembly has a hole which is open in the radial direction for receiving the said pin body (in the first embodiment, the hole is in the end portion of the reciprocating rod subassembly), a pin [22] insert into the hole, the pin body [22] is movable relative to the forked body [20] in the radial direction, the inner end of the pin body

[22] is inside said slot [16] when the pin body [22] is in its locking position, see FIG. 4, the inner end of the said pin body [22] is a pin [13] whose radius is gradually becoming smaller, in the locking position, 5 the pin [13] of the said pin body is inserted into the hole which is in the operating member [14], whereby the operating member is secured in its locking position.

The end portion of said reciprocating rod subassembly for receiving the operating member [14] has 10 a slot [16] provided for containing said operating member [14]; a pushing plate [12] which is movable in the axial direction is inserted into said slot [16], the pushing plate insert between the inner end of the pin body [22] and the side wall of the slot [16] when 15 said pin body [22] is in its unlocking position, see FIG. 4. The outer end of the pushing plate [12] is pressed on the inner end of the operating member [14] when the pin body [22] is in its locking position, as showed in FIG. 5.

20 A compression spring [9] is provided between said pushing plate [12] and said reciprocating rod subassembly, and the compression spring [9] make the pushing plate have a tendency to move towards the operating member [14].

In the first embodiment shown in FIG. 4, the first torsion spring [7] is biased on the outer sleeve [4] of the rotating sleeve [6], so the thread groove [5] make the guiding projection [21] which disposed on the sliding block [18] has the tendency of moving towards the right side, the upward force which is coming from the sliding block [18] and exerting onto the pin body [22] is larger than the downward force which is coming from the second torsion spring [17] and exerting onto the pin body [22], while the pushing plate [12] is inserted into the slot [16] and lies above the pin body [22], so the pin [13] is not movable upward. As shown in FIG. 5, the operating member [14] push the pushing plate inward when the operating member [14] (generally is a blade) is inserted into the slot [16], the pin [13] move upward once it is received by the locating hole, whereby the operating member [14] is located in its working position, accordingly, the sliding block [18] and the rotating sleeve move from the unlocking position indicated in FIG. 4 to the locking position. The rotating sleeve and the sliding block [18] leftwards move from the position indicated in FIG. 5 to the position indicated in FIG. 4 (i.e. from the locking position to the unlocking position), so the compression

force exerted on the pin body [22] is disappeared, the downward compressing force from the second torsion spring [17] cause the pin [13] move downwardly, thus resulting from the outwardly force exerted by the pushing plate [12], the operating member [14] ejects outwardly, and then is in the condition indicated in FIG. 4, the operating member (generally is a blade) is ejected out while don't need the operator take it out by his/her hand.

10 In the second embodiment indicated in FIG. 12, the pin [13] get the upward force coming from sliding block [18] and lock the operating member [14] in its locking position, when to take out the operating member [14], rotate the rotating sleeve, then the rotating sleeve and sliding block move from the locking position to unlocking position (move from the position shown in FIG. 12 to the position shown in FIG. 11), accordingly, the pin body [22] move from its locking position to unlocking position, resting in the unlocking position, 15 in this time, the operator can take the operating member [14] out of the slot [16] by hand, loosing the force exerting on the rotating sleeve, the actuating subassembly and locking subassembly return to the locking position automatically.

20

CLAIMS

1. A reciprocating power tool, comprises:

·a housing;

·a reciprocating rod subassembly which exert a
5 reciprocating movement in said housing, and said
reciprocating rod subassembly has an end portion for
receiving an operating member;

·an operating member locking mechanism which is
disposed on said reciprocating rod subassembly; said
10 operating member locking mechanism includes an
unlocking position, an actuating subassembly is movable
relative to said reciprocating rod subassembly between
a locking position and an unlocking position;

·a locking subassembly which has two operating
15 positions, a first operating position whereat said
operating member is locked to said reciprocating rod
subassembly; a second operating position whereat said
operating member is unlocked from said reciprocating
rod subassembly; said locking subassembly move between
20 said two positions; said locking subassembly move from
said locking position to said unlocking position when
said actuating subassembly move from said engaged
position to said disengaged position; said locking
subassembly move from said unlocking position to said

locking position when said actuating subassembly move from said engaged position move to said disengaged position;

Characterized in that:

5 Said actuating subassembly at least includes a rotating sleeve which is rotatable about said reciprocating rod subassembly, a sliding block which is movable relative to said reciprocating rod subassembly in a axial direction, there are thread grooves opened
10 in the inner wall of said rotating sleeve, a guiding projection is provided at the exterior of said sliding block, said guiding projection insert into said thread grooves, the interior of said sliding block is disposed with an inclined or curved guiding surface;

15 Said locking subassembly at least includes a pin body which is movable relative to said reciprocating rod subassembly in the radial direction, said outer end portion of the pin body is disposed with an inclined or curved guiding surface which is attached with said
20 inclined or curved guiding surface which is provided on said sliding block.

2. A reciprocating power tool of claim 1, wherein said outer end portion of said pin body is respectively connected with two ends of a second torsion spring

which give said pin body a tendency moving from a locking position to an unlocking position.

3. A reciprocating power tool of claim 1, wherein said reciprocating rod subassembly outside ring a first
5 torsion spring, an end portion of said first torsion spring is connected to said reciprocating rod subassembly and the other end portion of said first torsion spring is connected to said rotating sleeve.
4. A reciprocating power tool of claim 1, wherein an
10 outer surface of said rotating sleeve is provided with projecting ears.
5. A reciprocating power tool of claim 1, wherein said reciprocating rod subassembly is disposed with a slot which is opened in said axial direction and in which
15 said sliding block inserted.
6. A reciprocating power tool of claim 1, wherein an end portion for receiving said operating member of said reciprocating rod subassembly provided a slot for containing the operating member; said reciprocating
20 rod subassembly provided a hole in the axial direction for receiving said pin, said hole has said pin body inserted into, said inner end portion of said pin body lies in said slot when said pin body lies in its locking position.

7. A reciprocating power tool of claim 1, wherein an end portion of said reciprocating rod subassembly for receiving said operating member is disposed with a slot for containing said operating member, a pushing
5 plate which is movable in the axial direction is accommodated in said slot, said pushing plate extend into therebetween said inner end portion of pin body and side wall of said slot when said pin body lies in its locking position; an outer end portion of said
10 pushing plate press on said inner end portion of said operating member.

8. A reciprocating power tool of claim 1, wherein a compressing spring is provided between said pushing plate and said reciprocating rod subassembly, said
15 compressing spring give said pushing plate a tendency to move towards said operating member.

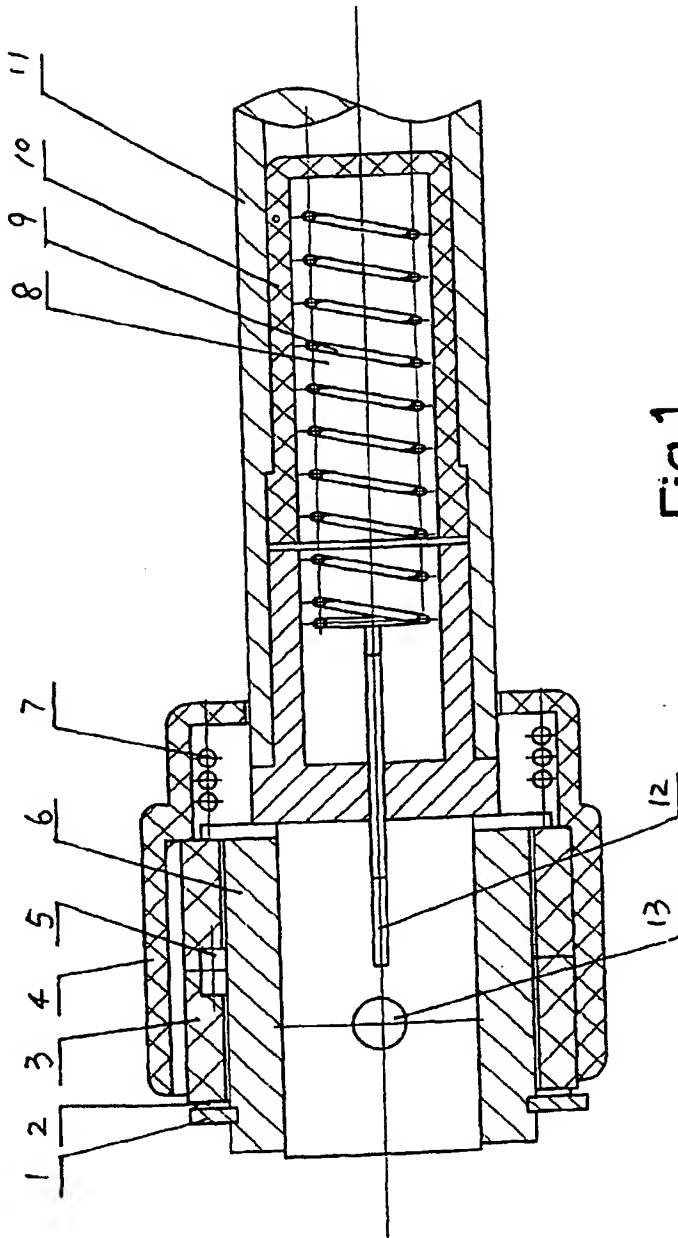


Fig. 1

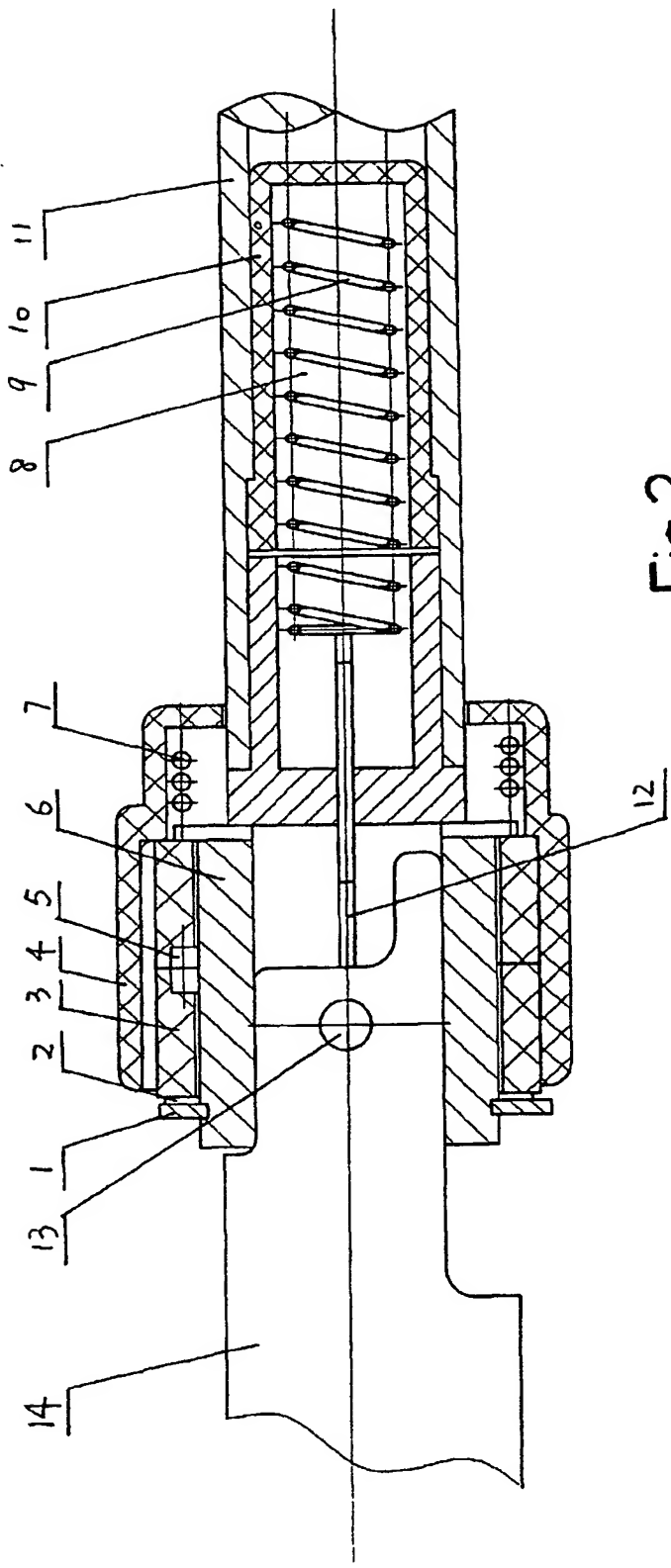


Fig. 2

3/17

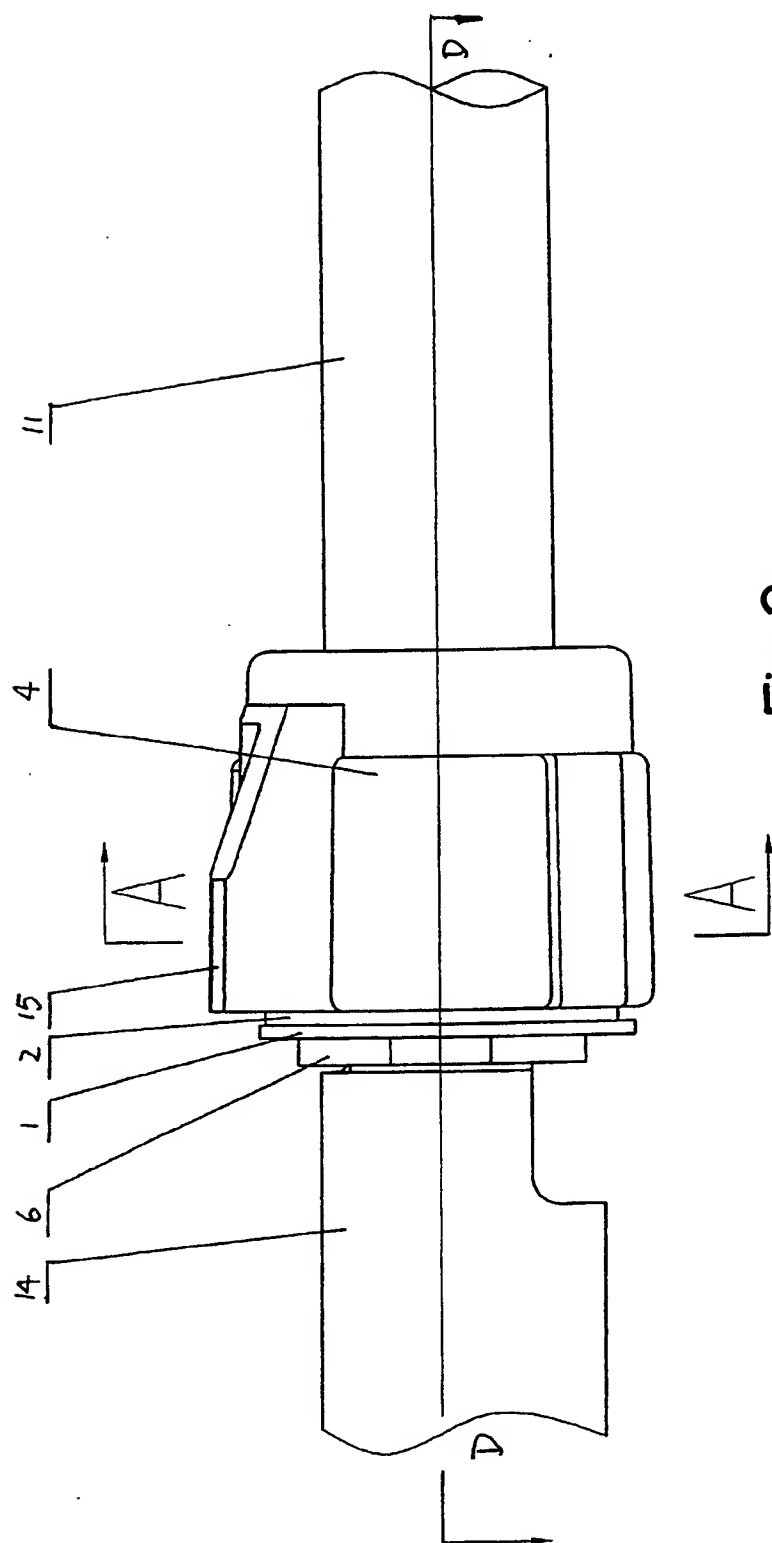


Fig. 3

4/17

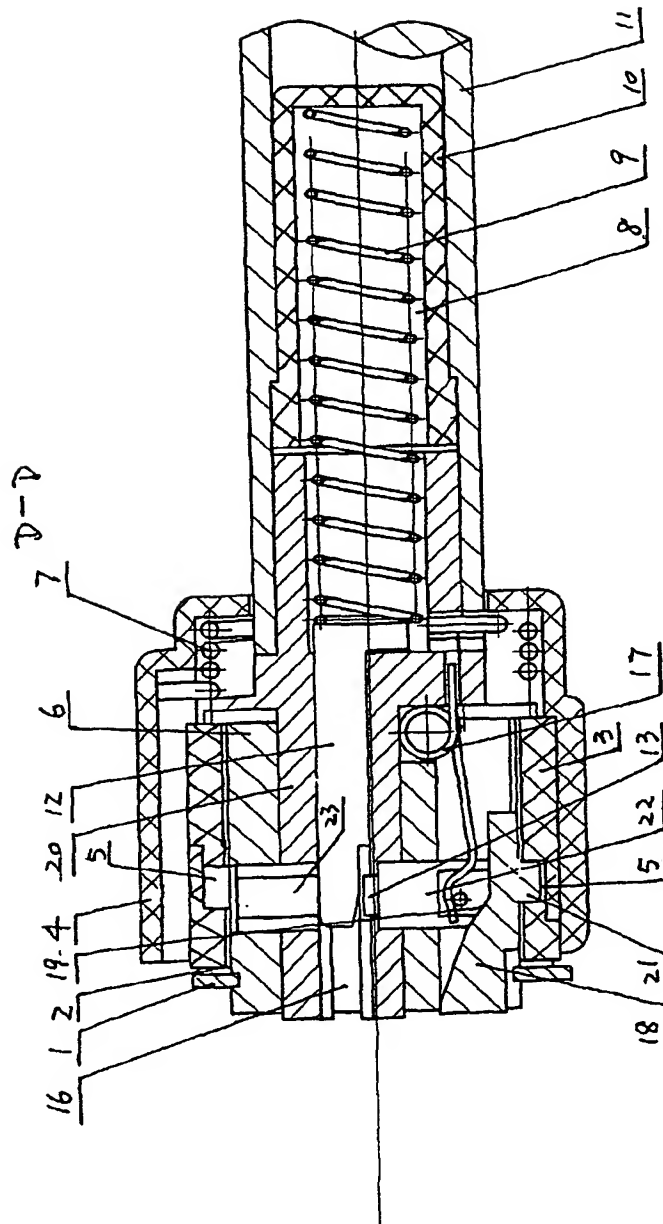


Fig. 4

5/17

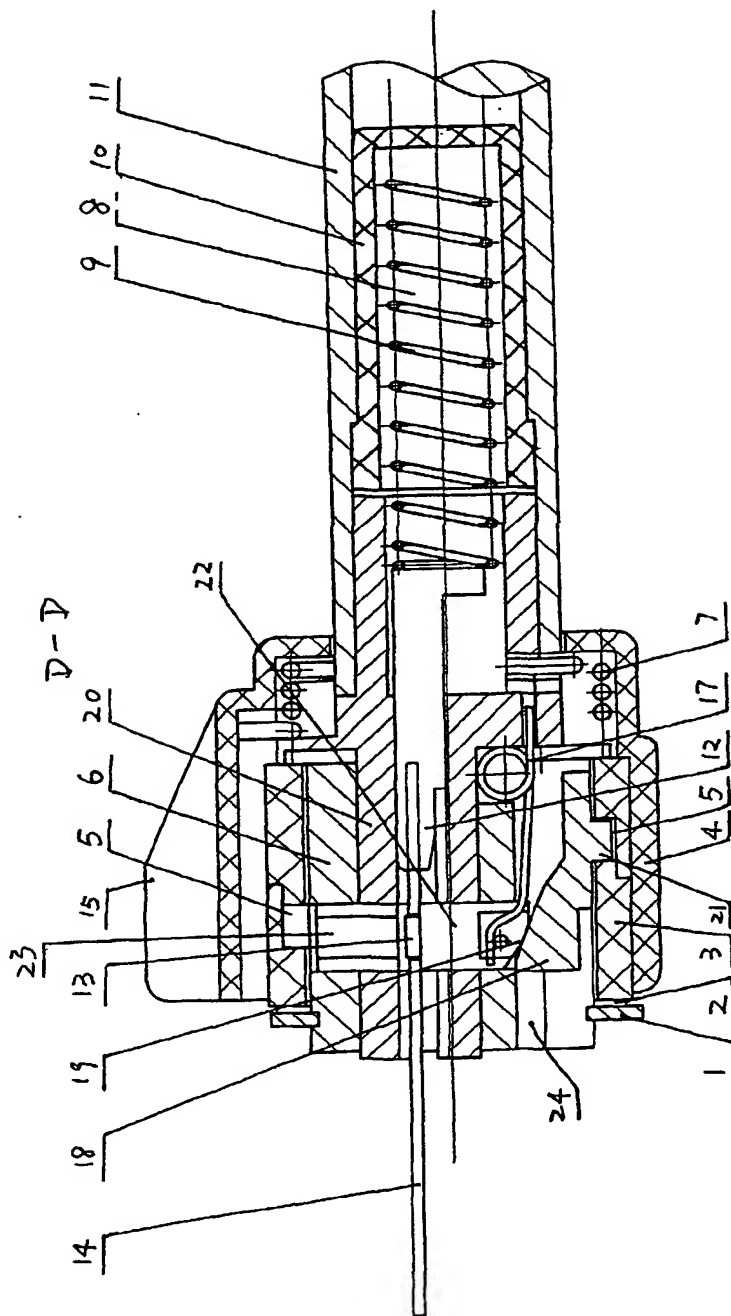


Fig. 5

6/17

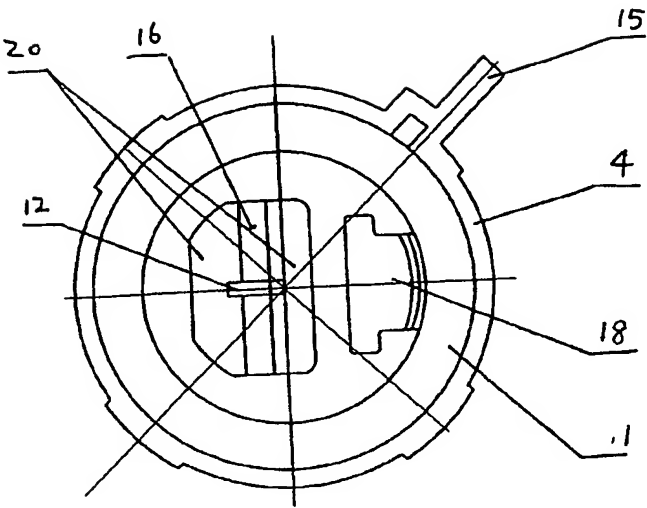


Fig. 6

A-A

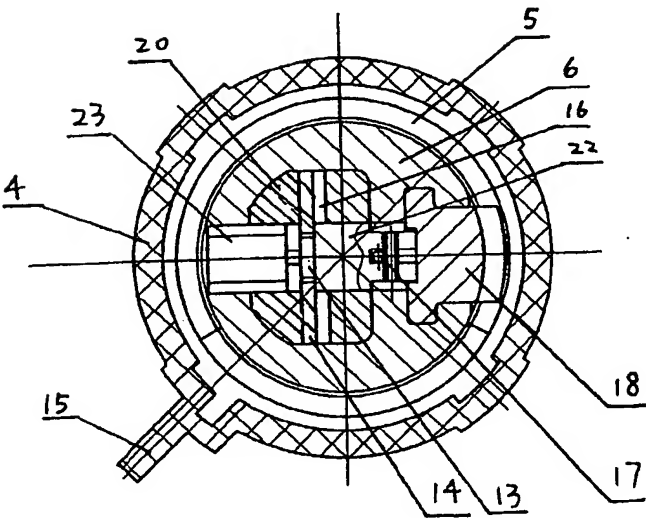


Fig. 7

7/17

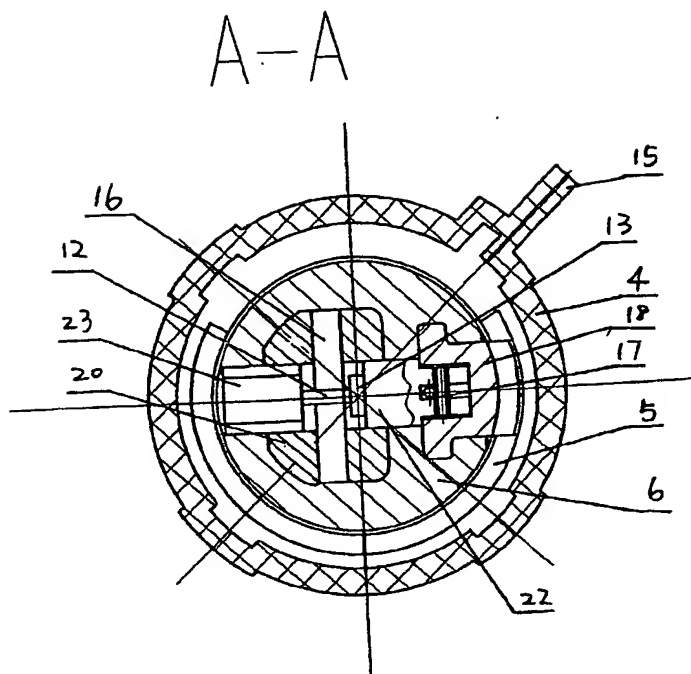


Fig. 8

8/17

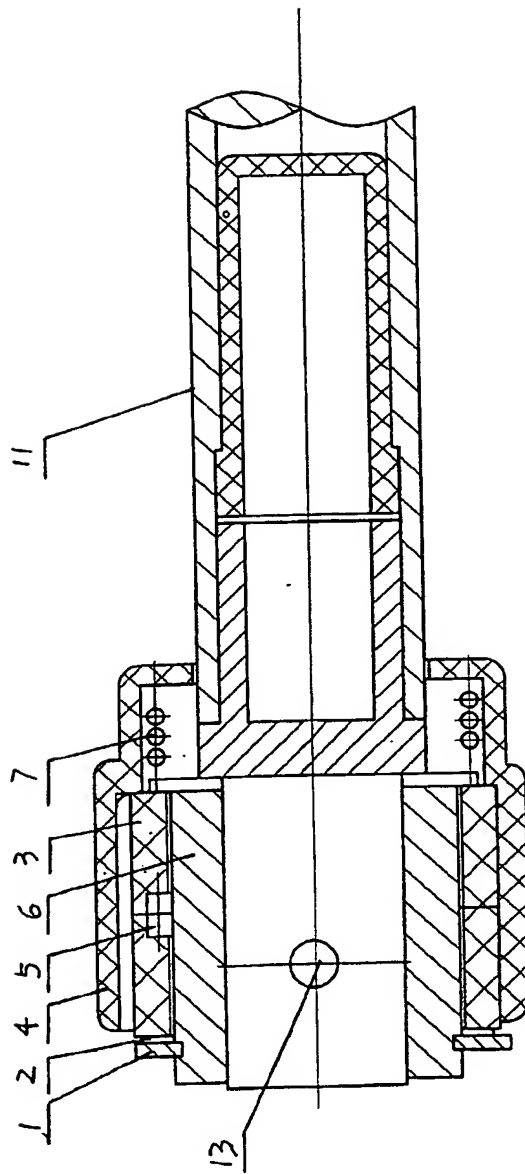


Fig. 9

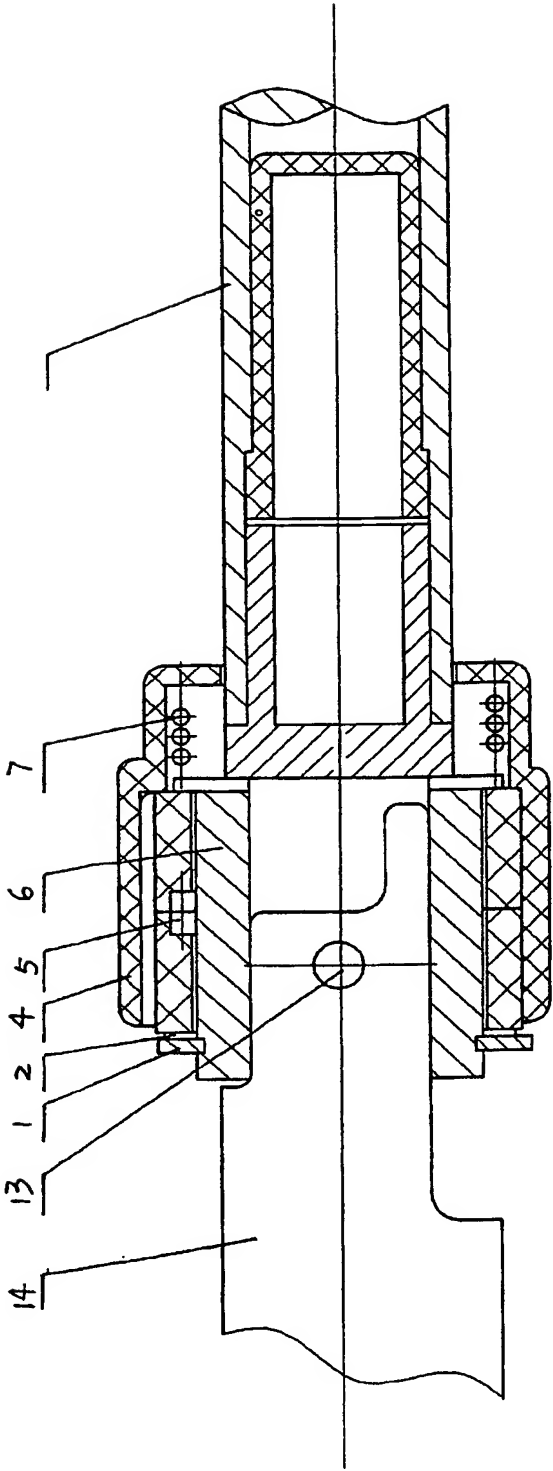


Fig.10

10/17

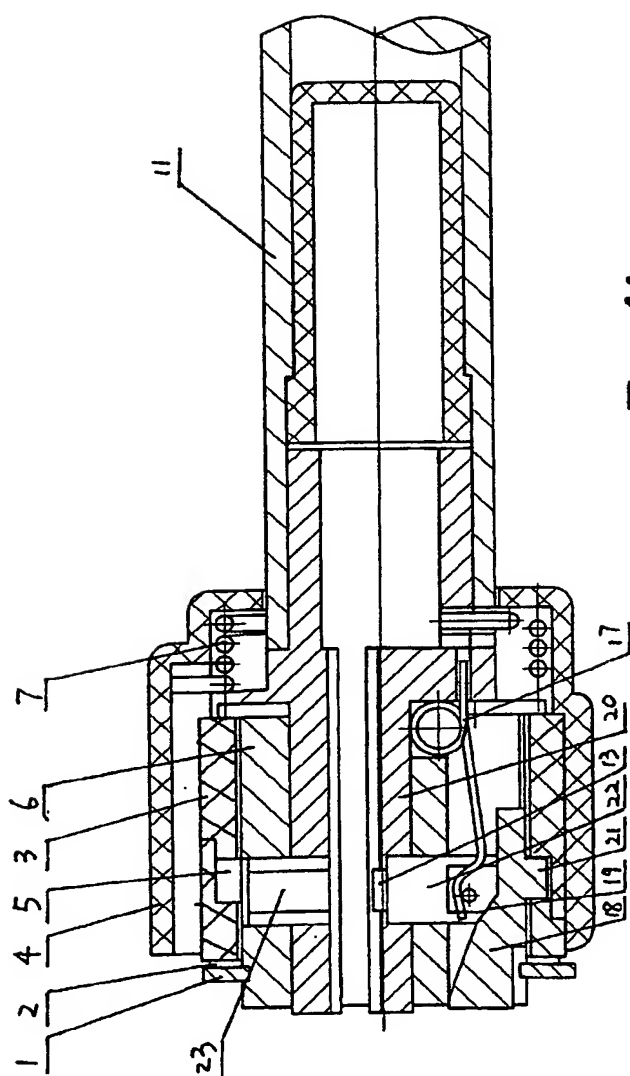


Fig. 11

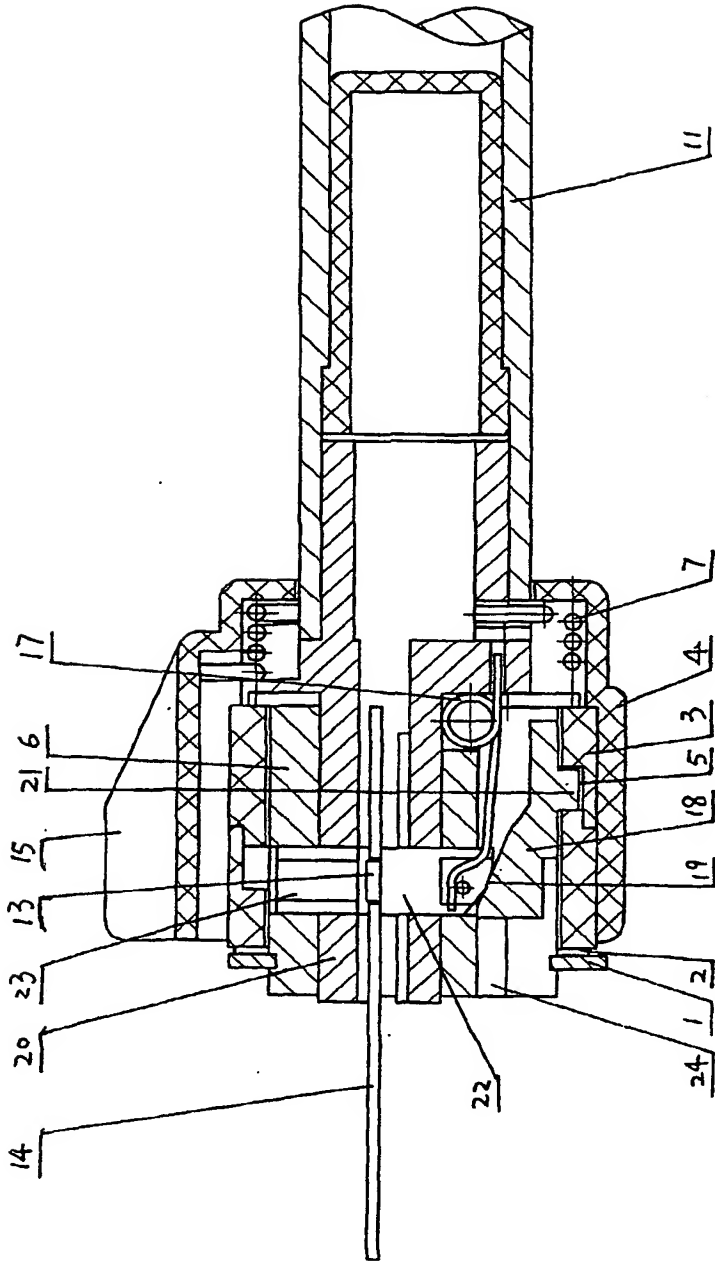


Fig.12

12/17

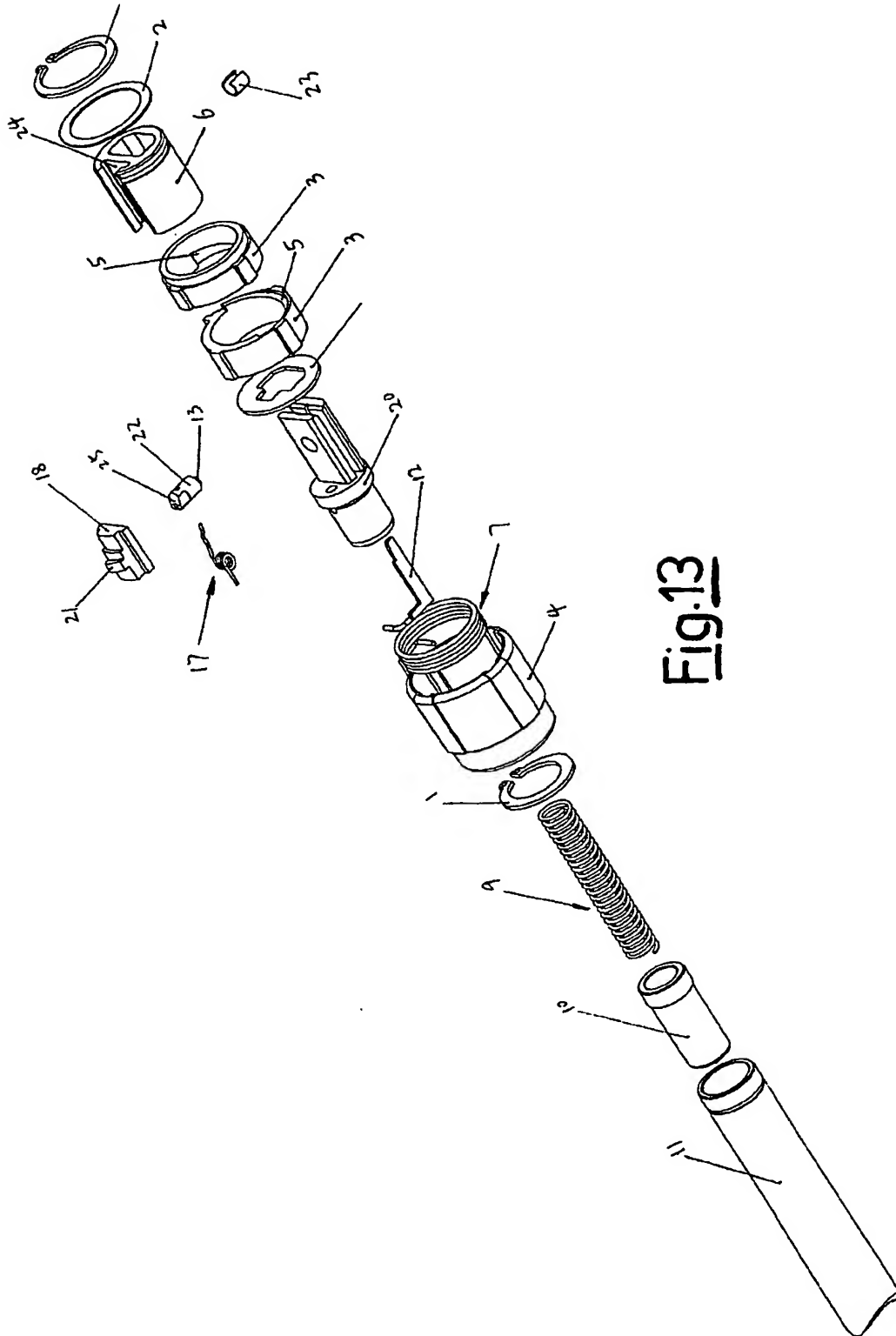


Fig. 13

13/17

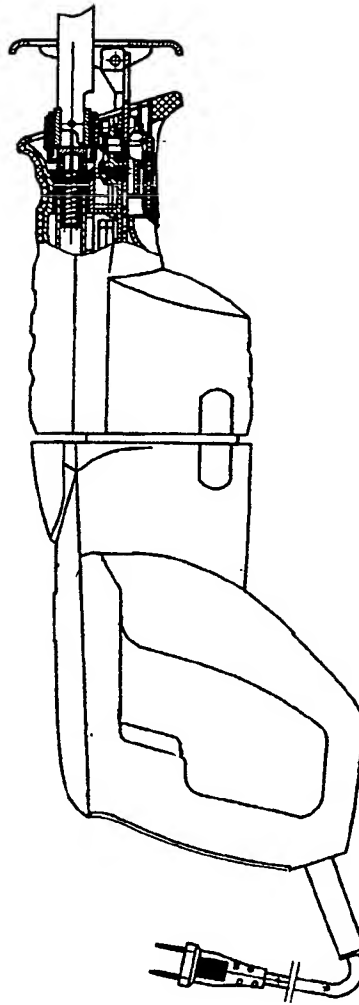
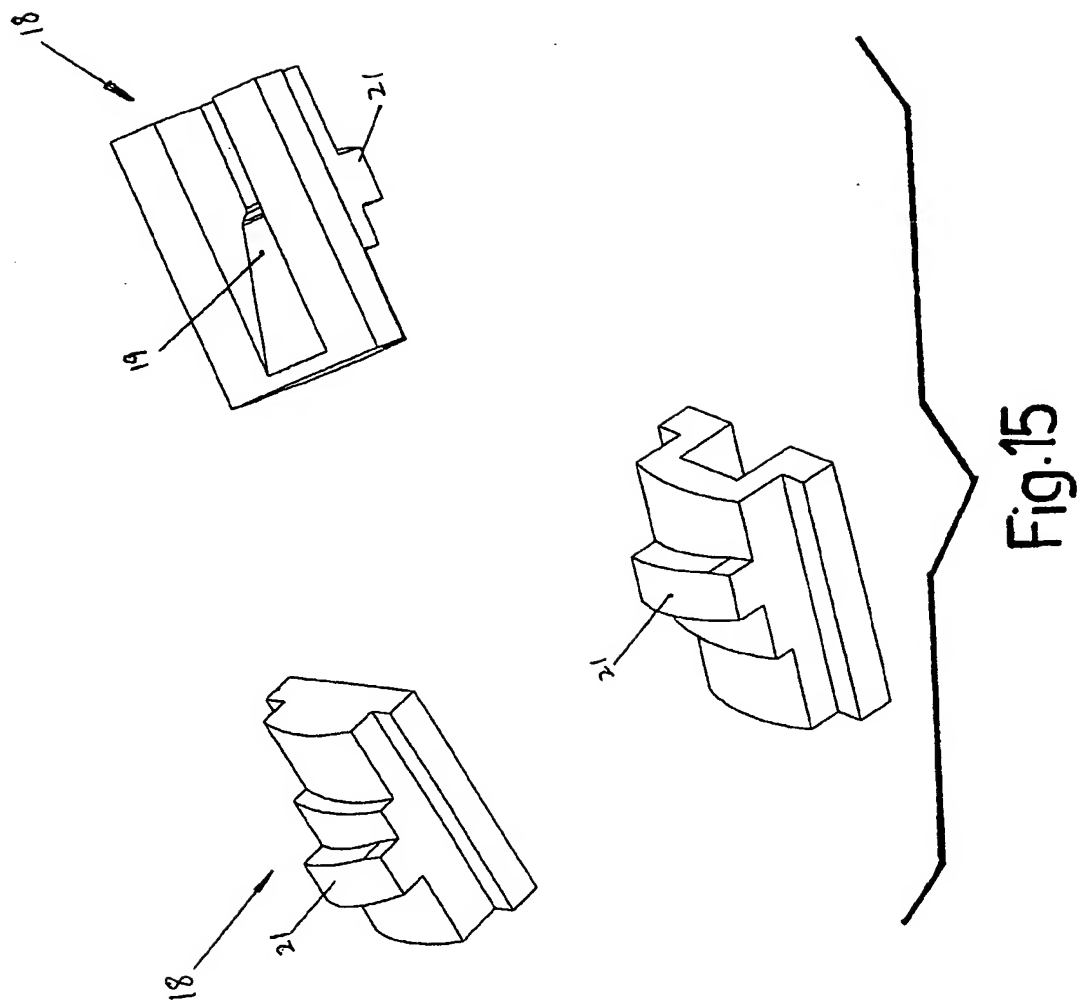
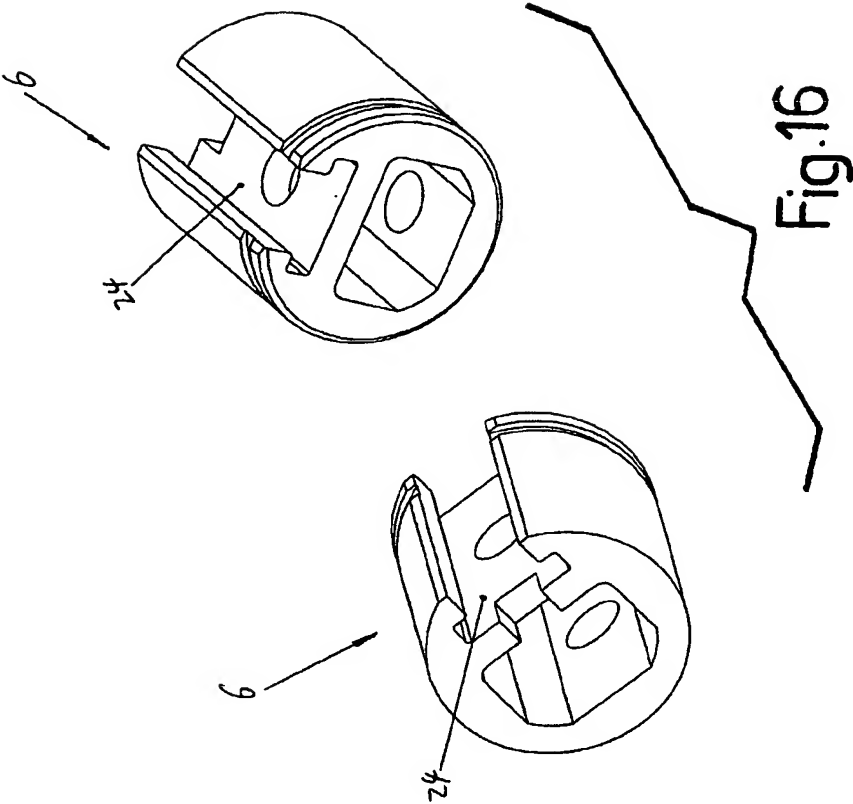


Fig. 14

14/17





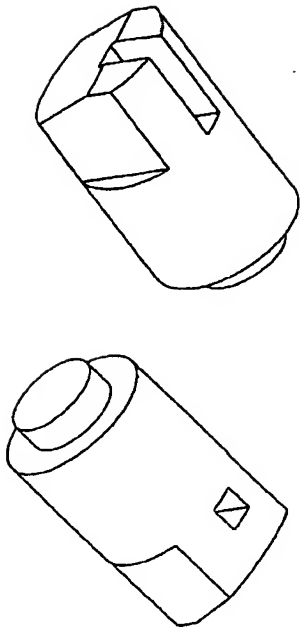


Fig.17

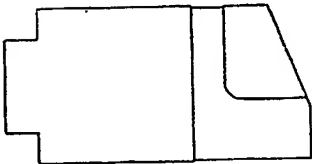


Fig.18

17/17

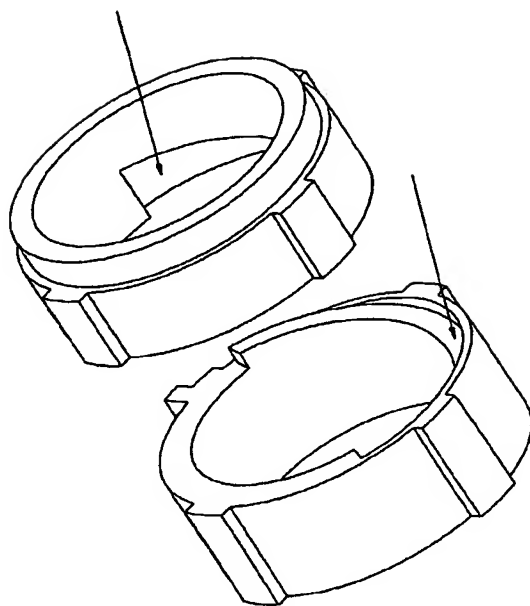


Fig.19

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
4 December 2003 (04.12.2003)

PCT

(10) International Publication Number
WO 2003/099523 A3

(51) International Patent Classification⁷: **B23D 49/00**,
B27B 19/02

(21) International Application Number:
PCT/IB2003/002037

(22) International Filing Date: 27 May 2003 (27.05.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
02113121.X 27 May 2002 (27.05.2002) CN

(71) Applicant (for all designated States except US):
POSITEC POWER TOOLS (SUZHOU) CO., LTD.
[CN/CN]; 461 East Ganjiang Road, Suzhou 215006 (CN).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **CHENGDAO, Li**
[CN/CN]; 461, East Ganjiang Road, Suzhou 215006
(CN). **BIN, Zhang** [CN/CN]; Room 202, Flat 3,
Huayanghuayuan Suzhou Jiangsu Province (CN).

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU,
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,
CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH,
GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC,
LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW,
MX, MZ, NI, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD,
SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US,
UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM,
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),
Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),
European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,
ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO,
SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM,
GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

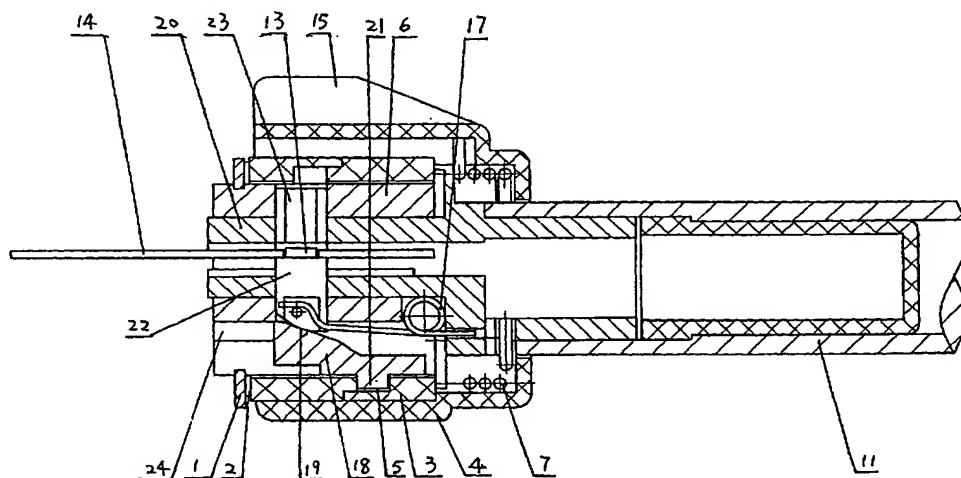
Published:

— with international search report

(88) Date of publication of the international search report:
22 July 2004

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: A RECIPROCATING POWER TOOL



(57) Abstract: The present invention relates to a reciprocating power tool, more particularly, relates to a clamping device for a blade which will cut the workpiece when the cutting work is doing. The reciprocating power tool comprises: a housing, a reciprocating rod subassembly, an operating member clamping mechanism. The operating member clamping mechanism includes an actuating subassembly, a locking subassembly, said actuating subassembly includes a rotating sleeve, a sliding block, there is thread provided in the inner surface of the rotating sleeve, a guiding projection outside the sliding block inserts into said thread grooves, an inclined guiding surface provided with the interior of the sliding block is engaged with the corresponding inclined guiding surface which is provided with a locking pin, by the guiding projection engaging with said thread grooves, when the rotating sleeve rotate and then carry the guiding projection moving in the axial direction of the reciprocating rod subassembly, then the sliding block carry the locking pin moving in the radial direction, thus the operation is easy to carry through and the rotating sleeve is rotatable in a large angle range.

rec'd PCT/PTO 29 NOV 2004

10/51656

INTERNATIONAL SEARCH REPORT

International application No.

PCT/IB03/02037

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 B23D 49/00 B27B 19/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B23D B27B B28D 1/06

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Chinese Invention 1985-2003, Chinese Utility Models 1985-2003

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI EPODOC CNPAT PAJ: 滑块 凸起 弧面 slide block protrusion projection

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE,U,2 0013789((CHEN-I) CHEN M) 11. Jan 2001(11.01.01) see the whole document	1
A	DE,A,3702670((LICN) LICENTIA PATENT-VERW GMBH)11.Aug 1988(11.08.88) see the whole document	1
A	JP,A,2001353619((MAKI-N) MAKITA CORP) 25.Dec 2001(25.12.01) see the whole document	1
A	UK,A,2048420((COAL) COAL IND PATENTS LTD)10. Dec 1980(10.12.80) see the whole document	1

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim (S) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

02. Feb 2004(02.02.04)

Date of mailing of the international search report

01. APR 2004 (01.04.2004)

Name and mailing address of the ISA/CN
6 Xitucheng Rd., Jimen Bridge, Haidian District,
100088 Beijing, China
Facsimile No. 86-10-62019451

Authorized officer

Zhang Liqian

Telephone No. 86-10-62085461

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/IB03/02037

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE20013789	11-01-01	None	
DE3702670	11-08-88	None	
JP2001353619	25-12-01	None	
UK2048420	10-12-80	None	

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☐ FADED TEXT OR DRAWING
- ☒ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☒ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☐ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.